

extensive employment. Bloch,<sup>24</sup> in 1907, was able to shorten this period considerably by mechanically injuring the inguinal lymph glands in guinea-pigs previous to inoculation and then injecting 1 c.c. of urine subcutaneously in the inguinal region. By this method he was able to demonstrate tuberculous inguinal lymph nodes in from nine to eleven days after inoculation in positive cases.

Following along the work of Heinke<sup>25</sup> and of Murphy and Ellis,<sup>26</sup> who showed the susceptibility of lymphoid tissue to infection after exposure to the roentgen-rays, Morton,<sup>27</sup> in 1916, advocated the routine inoculation of the roentgen-rayed guinea-pig as a laboratory test for urogenital tuberculosis. Morton demonstrated that in from eight to ten days in such animals, pathological studies showed tubercular lesions.

By making use of all the laboratory methods at our disposal, however, we are not always able to demonstrate the presence of tubercle bacilli in all cases. The guinea-pig test is not infallible, as shown by the reports of Terry<sup>28</sup> and of Barney and Young,<sup>29</sup> and occasionally the organisms may be demonstrated by centrifugation and staining when the guinea-pig test is negative.

#### BLOOD-PRESSURE AND KIDNEY FUNCTION FINDINGS IN ORTHOSTATIC ALBUMINURIA.<sup>1</sup>

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WITHIN recent years considerable interest has been shown in the peculiar condition for which Tessier,<sup>2</sup> in 1899, proposed the name of "orthostatic albuminuria." This condition has also several other names, such as cyclic, postural, intermittent and physiological albuminuria, but none of these convey such an exact meaning of the

<sup>24</sup> Nachweis des Tub.-bac. durch den Tierversuch, Berl. klin. Wehnschr., 1907, No. 17, xliv, 509.

<sup>25</sup> Experimentelle Untersuchungen über die Einwirkung der Rontgenstrahlen auf innere Organe, Mitt. a. d. Grenzgeb. d. Med. u. Chir., Jena, 1904-1905, xiv, 21.

<sup>26</sup> Experiments on the Role of Lymphoid Tissue in the Resistance to Experimental Tuberculosis in Mice, Jour. Exper. Med., 1914, xx, 397.

<sup>27</sup> A Rapid Method for the Diagnosis of Renal Tuberculosis by the Use of the Roentgen-rayed Guinea-pig, Jour. Exper. Med., 1916, xxiv, 419.

<sup>28</sup> Specimens of Tuberculosis of the Kidney in which the Guinea-pig Test was Negative, Boston Med. and Surg. Jour., February 16, 1917.

<sup>29</sup> The Value of the Guinea-pig Test in Genito-urinary Tuberculosis, Boston Med. and Surg. Jour., January, 1911, cxiv, 917.

<sup>1</sup> We wish to acknowledge our appreciation of a grant from the James Cooper Fund of McGill University, which has made this work possible.

<sup>2</sup> Semaine Méd., 1899, xix, 425.

true disturbance as orthostatic albuminuria. In brief, such cases are those that show the presence of serum albumin in the urine when in the erect position, which albumin completely disappears upon assuming the recumbent position.

Orthostatic albuminuria has been recognized for many years, but of the exact nature of the disturbance we still remain in ignorance. It is equally common among young people of both sexes, most of the cases falling between the sixteenth and twenty-second years. Previously males were thought to be more susceptible to the condition than females, but now we know that to be untrue. Lommel states that the condition is present in varying degrees in about 19 per cent. of adolescents between fifteen and twenty-one years of age. The condition, as a rule, occurs in poorly nourished anemic individuals, they being usually rather lean in appearance and showing certain manifestations of vasomotor instability. It is often possible to trace its presence through several generations, and Lacour reports its occurrence in three children in the same family.

The amount of serum albumin that appears in the urine when in the upright position varies greatly, by far the largest number showing only a trace with heat and acetic acid while a few show as much as 5, 6 and even to 10 grams per liter. As a rule, serum globulin is not present. The albumin may or may not be accompanied by casts or cylindroids. Usually they are not present, but cylindroids are of slightly greater frequency than casts. Jehle<sup>3</sup> reported 1 case in which casts and red blood cells were present with the albumin. The albuminuria usually reaches its maximum in the forenoon, decreasing during the afternoon hours. The amount present has little relation to exercise except that there seems to be a tendency for traces to disappear in mild cases which can be accounted for by the associated increased pulse-pressure. Exercise while in the recumbent position never produces an albuminuria.

Quantitative examinations of the urine excreted fail to show any abnormality (Archard,<sup>4</sup> Merklen and Claude<sup>5</sup>). This is confirmed by the following nitrogen partition in one of our cases:

Serial No. 1; Medical No. 24505. Date: November 1, 1916.  
Twenty-four-hour urine: 700 c.c.

	Per cent.	Gm. per 24 hours.	Percentage of total nitrogen.
Total N. . . . .	0.901	6.307	
Urea N. . . . .	0.724	5.068	80.4
Ammonia N. . . . .	0.046	0.322	5.1
Creatinine N. . . . .	.....	0.273	4.3
Uric acid N. . . . .	.....	0.163	2.6
Rest N. . . . .	.....	0.481	7.6
Urea . . . . .	1.551	10.857	
Ammonia . . . . .	0.056	0.392	
Creatinine . . . . .	0.105	0.735	
Creatin . . . . .	0	0	
Uric acid . . . . .	0.070	0.490	

<sup>3</sup> Ergeb. d. inn. Med. u. Kinderheilk., 1913, xii, 808.

<sup>4</sup> Compt. rend. Soc. méd. d. hôp., June 22, 1900.

<sup>5</sup> Ibid., July 27, 1900.

The three theories of the cause of orthostatic albuminuria which have received the greatest consideration are:

1. A developmental defect of glomeruli resulting in their increased permeability (Tessier).<sup>6</sup>
2. Vasomotor instability, the albuminuria being due to a diminished pulse-pressure (Erlanger and Hooker).<sup>7</sup>
3. A mechanical interference with the renal circulation, due to increased lordosis (Jehle).<sup>8</sup>

THE THEORY OF TESSIER. The argument of Tessier was advanced in 1905 but has never met with much approval, as it is based upon no demonstrable facts. It is true that these people are often poorly developed, especially their arterial systems, and many of them have a small heart and a subnormal body weight. In this connection Leube calls it the albuminuria of adolescence, explaining it as being due to a slight inability on the part of the kidney to keep pace with the rest of the growing organism. As the patients become older a readjustment takes place or the temporary insufficiency is improved, as shown by the disappearance of the albuminuria, with mature years. Other evidences of faulty development are also commonly found, such as varying degrees of general visceroptosis, shown by the roentgen rays, and easily palpable kidneys. Bass and Wessler<sup>9</sup> found that 30 per cent. in a series of thirty-six children with orthostatic albuminuria showed hearts of the "drop type," and many of them showed other signs of maldevelopment.

THE THEORY OF ERLANGER AND HOOKER. The work of Erlanger and Hooker in 1904 resulted in the presentation of the vasomotor instability theory, the cause of the albuminuria being due to the low pulse-pressure present when they assume the upright position. We know that when a normal person assumes the upright position the pulse-pressure becomes smaller, but in cases of orthostatic albuminuria the decrease is much more marked. In normal persons the maximum and minimum pressures always tend to approach each other, but there may be either a raising or a dropping of the maximum pressure. In cases of orthostatic albuminuria the maximum pressure usually remains constant and the change takes place in the minimum pressure. This is well shown in the reported cases. Edel<sup>10</sup> has presented some evidence which shows there is a loss of control of the cardiovascular system on the part of the vasomotor system, resulting in the former's inability to respond to ordinary changes. His cases failed to show the usual rise in pulse-pressure after a warm bath and cold sponges. Exercise, such as climbing stairs, had much less influence upon pulse-pressure than in a normal

<sup>6</sup> *Revue der méd.*, 1905, **xxv**, 233.

<sup>7</sup> *Johns Hopkins Hosp. Reps.*, 1904, **xii**, 145.

<sup>8</sup> *München. med. Webschr.*, 1908, **iv**, 12.

<sup>9</sup> *Arch. Int. Med.*, 1913, **xi**, 403.

<sup>10</sup> *Ibid.*, 1914, **xiii**, 39.

individual. As early as 1886 Craig<sup>11</sup> offered the suggestion that the albumin was present in the urine as the result of low arterial tension, and he claimed that he could cause the albuminuria to disappear by raising the blood-pressure. Bass and Wessler<sup>12</sup> in their 36 children, came to the conclusion that the hearts of the children failed to become smaller after exercise which they believed to be due to a partial loss of the nervous control resulting in limited cardiac response.

Erlanger and Hooker<sup>13</sup> in their studies on pulse-pressure, arrived at the following conclusions:

1. Amount of urine secreted varies directly with the magnitude of pulse-pressure.
2. In a case of orthostatic albuminuria the amount of albumin in the urine varies inversely as the magnitude of pulse-pressure.
3. Urea, chlorides and phosphates secreted in the urine vary directly with the magnitude of pulse-pressure.

Again, Gesell<sup>14</sup> showed that with the same volume of flow through the kidney and a diminished pulse-pressure the nutrition of the kidney cells would be altered. The higher pulse-pressures give the kidney more massage, for we know that mechanical shock greatly influences the functions of protoplasm. This was well shown by Kahlenberg<sup>15</sup> in dialyzing solutions through osmotic membranes. Only when stirring takes place (mechanical shock) can the maximum osmotic pressure be obtained. Again, pulsating fluid is better able to penetrate into every part of an organ than one driven by a constant pressure. The diminished pulse-pressure also interferes with the gaseous exchange in the kidneys, as shown by Fleischel v. Marxow.<sup>16</sup> Accordingly the nutrition of the kidney cells is interfered with. These facts all point toward the lowered pulse-pressure as upsetting the normal metabolic processes of the renal cells as well as those of the glomeruli, which allows them to become permeable to serum albumin and at the same time alters their function.

THE THEORY OF JEHLE. In 1908 Jehle<sup>17</sup> advanced the mechanical theory, based upon the presence of an increased lordosis, which is often present. The lordosis is usually found at the level of the twelfth dorsal and first and second lumbar vertebrae, and interferes with the venous return of blood from the kidneys when exaggerated by the upright position. Experimentally, Jehle was able to cause the albumin to disappear by correcting the lordosis while in the upright position, but coincident pulse-pressure observations are lacking. This could be done either by abdominal support or by raising one leg on a chair. Also, he was able to produce albuminuria

<sup>11</sup> British Med. Jour., 1886, i, 333.

<sup>12</sup> Loc. cit.

<sup>13</sup> Loc. cit.

<sup>14</sup> Am. Jour. Physiol., 1913, xxxii, 70.

<sup>15</sup> Jour. Physiol. Chem., 1906, No. 3, x.

<sup>16</sup> Beitrage zur Phys. zu Ludwig gewidmet, 1887, p. 29.

<sup>17</sup> Loc. cit.

in normal individuals by artificially producing lordosis and by pressure upon the larger venous trunks through the abdominal wall. Nothmann confirmed Jehle's work as regards the production of albuminuria by artificially produced lordosis as well as to lower pulse-pressure by artificially produced lordosis while in the horizontal position. Muscular exercise, while in the horizontal position, fails to cause albumin to appear in the urine (Guilblain<sup>18</sup>).

It is well known how sensitive the renal cells are to slight changes in their nutrition. Jehle believes that the passive congestion from which the kidneys suffer when the lordosis is exaggerated interferes with their nutrition. This retarded circulation interferes with the cells food supply and with the removal of their waste products in a similar manner as when caused by a lowered pulse-pressure. It is known that the epithelium of the glomeruli is more sensitive to agents that increase its permeability than that of the convoluted tubules. This diminished blood flow through the kidney causes the excretion of a small amount of highly concentrated urine, which concentration is not in proportion to the oliguria.

During the last year we have had the opportunity to study 5 cases of orthostatic albuminuria, 4 of which are quite typical. Our observations that are of special interest have been made upon pulse-pressure and kidney function when in different positions. A brief synopsis of each case follows, after which the special findings are given in more detail.

Serial No. 1; Medical No. 24505. Male, aged eighteen years. Admitted to the Royal Victoria Hospital September 4, 1916, complaining of "discomfort in the pit of the stomach."

*Present Illness.* For many years has had headaches, with occasional spells of nausea and vomiting. Since March, 1916, has had a feeling of distress in his epigastrium, which comes on about one and a half hours after all meals. This distress continues until he eats his next meal, when it disappears for a short time. Chronically constipated for as long as he can remember and has lost twenty pounds in weight since March, 1916. No urinary symptoms.

*Personal History.* A weak child; no history of scarlet fever or of other kidney involvement.

*Family History.* Unimportant.

*Present Condition.* The young man is thin, lanky, poorly developed; weight, 92 pounds. Mucous membranes are pale.

*Lymphatic System.* Tonsils greatly enlarged, but there is no general glandular enlargement.

*Respiratory System.* Thorax is long, thin and flat, but symmetrical. Expansion is good.

*Cardiocirculatory System.* Pulse is of a low tension and vessel walls are not palpable. The heart is small and tends to be of the "drop type."

<sup>18</sup> Arch. Int. Med., 1910, v, 491.

*Digestive System.* The abdomen is scaphoid. The liver is palpable one finger's breadth below the costal margin. The spleen is not palpable. The right kidney is easily palpable when in the upright position.

*Genito-urinary System.* Normal.

*Locomotor and Integumentary Systems.* The muscular development is poor and the muscles are of poor tone. There is marked mobility of the lower dorsal and lumbar spines; when standing the normal lordosis is considerably exaggerated.

*Nervous System.* Normal.

*Blood.* Red blood cells, 4,320,000; hemoglobin (Sahli), 72 per cent.; white blood cells, 8200.

*Gastric Analysis.* September 8, 1916. The preliminary lavage was clear. One hour after a test-meal 50 c.c. were removed. Reaction acid. The total acidity was 71, with a free HCl of 43. There were neither lactic acid nor blood present. Microscopically the findings were normal.

*Urine.* The urine failed to show casts or cylindroids at any time.

*Radiological Report.* Marked general visceroptosis. Heart narrow and long. Marked ptosis and atony of stomach. Extreme splenic and hepatic flexure acuity.

NOTE.—This case was treated by a spinal brace, with an abdominal support. On June 6, 1917, when wearing his brace, his urine contained no albumin when voided in the upright position. General condition had greatly improved.

Serial No. 2; Medical No. 24684. Male, aged forty-three years. Admitted to the Royal Victoria Hospital October 12, 1916, complaining of indefinite pains in the stomach, constipation and weakness.

*Present Illness.* Since March, 1916, he has felt tired, has had no appetite and has been very constipated. At times he has experienced a sensation of food sticking in the epigastrium after meals, which would be followed by some belching of gas. Has been very nervous and has lost 20 pounds in weight within the last six months.

*Personal History.* Unimportant.

*Family History.* There is an indefinite history of "kidney disease" in the father and in one sister.

*Present Condition.* He is a poorly developed, undernourished, hypersensitive Jew. Muscles are flabby and mucous membranes are pale. Weight 112 pounds.

*Lymphatic System.* Normal.

*Respiratory System.* Chest is long and flat. Expansion is poor and at both apices there are signs of an early tuberculous process.

*Cardio-circulatory System.* Heart rather small and pulled down by a sagging diaphragm.

*Digestive System.* No abdominal organs are palpable. Upon standing there is considerable bulging of the lower quadrants.

*Genito-urinary System.* Normal.

*Locomotor and Integumentary Systems.* When standing there is a slightly increased lordosis.

*Nervous System.* Reflexes increased.

*Blood.* Red blood cells, 4,040,000; hemoglobin (Sahli), 58 per cent.; white blood cells, 15,000. Blood-pressure (lying): systolic, 138; diastolic, 88.

*Gastric Analysis.* Normal.

*Urine.* Showed no casts at any time.

*Radiological Report.* Gastro-enteroptosis. Ileal and colonic stasis.

Serial No. 3; Medical No. 25406. Female, aged twelve years. Admitted to the Royal Victoria Hospital March 12, 1917, complaining of "epileptic fits," headaches and constipation.

*Present Illness.* Since nine years of age she has had "fits" once or twice a week. After each one she suffers from a headache. Has been constipated for five years. No urinary symptoms.

*Personal History.* When eleven months old had "spinal fever," after which she was paralyzed for several months.

*Family History.* Unimportant.

*Present Condition.* She is a moderately well-developed young girl; weight, 94 pounds. The physical examination is negative except for a slightly exaggerated lordosis and a palpable right kidney when standing. The *urine* at no time contained casts or cylindroids.

Serial No. 4; Medical No. 25678. Male, aged twenty years, admitted to the Royal Victoria Hospital April 28, 1917. There were no complaints as the condition was discovered during a life insurance examination.

*Personal History.* For several years his lower back has been rather easily tired after physical work. Occasionally has headaches and is constipated. There have been no urinary symptoms.

*Family History.* Unimportant.

*Present Condition.* He is a rather lanky young man of only fair muscular development. The lower dorsal and lumbar spines are very flexible, and when in the upright position the normal lordosis is considerably increased. The lower pole of the right kidney is palpable when standing, otherwise the physical examination is negative. Weight, 137 pounds.

The *urine* contained no casts or cylindroids.

Serial No. 5; Medical No. 25649. Female, aged twenty-one years, admitted to the Royal Victoria Hospital April 22, 1917, complaining of indefinite pains across the lower back, headaches and dizzy sensations.

*Present Illness.* Since August, 1916, has suffered from a dull, aching sensation over the lumbar region, especially in the right side, headaches and flushing of face. Infrequently has experienced dizziness on rising in the morning. There has been slight nycturia for the last five years but no polyuria or dysuria. Bowels are regular.

*Personal History.* Normal except for a right-sided pleurisy, with effusion one year ago, which was considered to be tubercular.

*Family History.* Unimportant.

*Present Condition.* She is a rather thin, flexible girl, with a fair muscular development. Spine is excessively mobile, and when in the upright position the normal degree of lordosis is considerably increased. Mucous membranes are pale. Weight, 116 pounds, otherwise physical examination is negative except for a palpable right kidney (lower pole) when standing.

*Fluoroscopic Examination.* Shows heart to be long and thin.

*Urine.* Cylindroids were found on one examination. Casts were not found.

Blood-pressure. Blood-pressure observations were made upon 4 of these 5 cases as well as upon 3 cases of acute nephritis, 1 case of chronic diffuse nephritis and upon several other ward cases whose troubles were not referable to their kidneys. All estimations were made with a Nicholson mercury instrument with a 11.5 cm. arm band. As the findings proved to be of such interest they are given in full:

Serial No. 1; Medical No. 24505. (Average of three estimations.)

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	94	55	39
II. Sitting; feet up . . . . .	93	74	19
III. Sitting; feet down . . . . .	94	74	20
IV. Standing . . . . .	94	80	14
V. Standing; with brace . . . . .	94	80	14

Serial No. 2; Medical No. 25406. (Average of two estimations.)

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	115	55	60
II. Lying with two pillows in small of back . . . . .	112	80	32
III. Standing . . . . .	112	80	32
IV. Standing up against wall . . . . .	112	78	34
V. Standing with one leg raised at right angles to trunk . . . . .	112	75	37

Serial No. 4; Medical No. 25678. (Average of two estimations.)

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	130	84	46
II. Lying with two pillows in small of back . . . . .	130	84	46
III. Standing . . . . .	130	90	40
IV. Standing up against wall . . . . .	128	90	38
V. Standing with one leg raised at right angles to trunk . . . . .	128	86	42

Serial No. 5; Medical No. 25649. (Average of two estimations.)

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	140	55	85
II. Lying with two pillows in small of back . . . . .	140	80	60
III. Standing . . . . .	140	85	55
IV. Standing up against wall . . . . .	140	85	55
V. Standing with one leg raised at right angles to trunk . . . . .	140	80	60

The following are the findings in the 3 cases of acute nephritis:  
Medical No. 25374.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	124	60	64
II. Lying with two pillows in small of back	124	64	60
III. Standing . . . . .	115	74	41
IV. Standing up against wall . . . . .	117	70	47
V. Standing with one leg raised at right angles to trunk . . . . .	120	73	47

Medical No. 24738.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	120	75	45
II. Lying with two pillows in small of back	115	85	30
III. Standing . . . . .	115	95	20
IV. Standing up against wall . . . . .	115	88	27
V. Standing with one leg raised at right angles to trunk . . . . .	115	90	25

Medical No. 24890.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	115	62	53
II. Lying with two pillows in small of back	118	62	56
III. Standing . . . . .	118	88	30
IV. Standing up against wall . . . . .	115	78	37
V. Standing with one leg raised at right angles to trunk . . . . .	120	75	45

The remaining cases follow with their diagnoses:

Medical No. 25604. Diagnosis: chronic diffuse nephritis.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	115	80	35
II. Lying with two pillows in small of back	112	80	32
III. Standing . . . . .	116	84	32
IV. Standing with one leg raised at right angles to trunk . . . . .	115	86	29

Medical No. 25705. Diagnosis: chlorosis.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	102	66	42
II. Lying with two pillows in small of back	99	60	39
III. Standing . . . . .	94	56	38
IV. Standing with one leg raised at right angles to trunk . . . . .	102	60	42

Medical No. 25702. Diagnosis: diabetes mellitus.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	139	78	61
II. Lying with two pillows in small of back	138	81	57
III. Standing . . . . .	138	89	49
IV. Standing with one leg raised at right angles to trunk . . . . .	138	78	60

Medical No. 25410. Diagnosis: diabetes mellitus.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	141	80	61
II. Lying with two pillows in small of back	135	85	50
III. Standing . . . . .	138	85	53
IV. Standing with one leg raised at right angles to trunk . . . . .	138	87	49

Medical No. 25738. Diagnosis: visceroptosis.

	Systolic.	Diastolic.	Pulse-pressure.
Position: I. Lying . . . . .	128	80	48
II. Lying with two pillows in small of back	124	80	44
III. Standing . . . . .	128	78	50
IV. Standing with one leg raised at right angles to trunk . . . . .	126	76	50

**DISCUSSION OF BLOOD-PRESSURE RESULTS.** The above results confirm Erlanger and Hooker's finding of the remarkable decrease in pulse-pressure which is present when cases of orthostatic albuminuria assume the upright position. The point of special interest to us has been the production of almost as low a pulse-pressure when they are in the horizontal position with exaggerated lordosis artificially produced by placing two pillows in the small of the back. We do not understand why that is true unless the increased lordosis acts in some way through the sympathetic system. The fact that the maximum pressure remains practically constant in all the cases, the alteration taking place in the minimum pressure, is important. Invariably the albuminuria varied inversely as the pulse-pressure, being most marked in Case 1, which had a standing pulse-pressure of only 14. In this case there was no albuminuria when lying in bed, while with standing the output was about 2 gm. per liter, depending somewhat upon the degree of oliguria. In Case 4 the maximum albuminuria was 1.5 gm. per liter when standing, with its complete disappearance when lying flat in bed. Cases 3, 4 and 5 all showed moderate amounts of albuminuria when lying in the horizontal position, with two pillows in the small of the back. In Cases 1 and 2 this point was not determined.

In the 3 cases of acute nephritis examined the reduction in pulse-pressure is practically as marked as in the orthostatic cases, but in 2 of them there is a reduction in the systolic pressure. All 3 of these cases showed an albuminuria which varied inversely as the pulse-pressure. The remaining cases present more normal findings: that is, a slight reduction in pulse-pressure upon assuming the upright position, with the alterations taking place in either the maximum or minimum pressures, or in both.

**KIDNEY FUNCTION.** *The Nephritic Test-meal.* Nephritic test-meals, according to Mosenthal's<sup>19</sup> modification of Hedinger and

Schlayer's<sup>20</sup> technic, were carried out in all 5 cases when in the recumbent and in the erect positions. In the latter the patient remained standing from 8 A.M. to 8 P.M. The results are typical, showing the marked oliguria with high concentration which takes place when in the upright position in contrast to a normal function when lying in bed. Neither by day nor by night was there any evidence of an inability to concentrate salt or nitrogen. Below two typical meals are given in full, one in each position:

## NEPHRITIC TEST-MEAL.

Serial No. 1. September 9, 1916.

Time of day.	Urine, c.c.	Specific gravity.	Sodium chloride, Per cent.	Gm.	Nitrogen, Per cent.	Gm.
8 to 10 . . . .	26	1035				
10 to 12 . . . .	30	1033				
12 to 2 . . . .	41	1035				
2 to 4 . . . .	51	1035				
4 to 6 . . . .	40	1036				
6 to 8 . . . .	55	1036				
Total day . . . .	243	....	0.925	2.20	1.00	4.56
Night, 8 to 8 . . . .	200	1033	0.940	1.88	2.09	4.18
Total, 24 hours . . . .	443	....	....	4.08	....	8.74
Intake . . . .	1560	....	....	8.0	....	13.0
Balance . . . .	+1117	....	....	+3.92	....	44.26

NOTE.—Standing from 8.00 A.M. until 8.00 P.M.

Serial No. 5. April 26, 1917.

Time of day.	Urine, c.c.	Specific gravity.	Sodium chloride, Per cent.	Gm.	Nitrogen, Per cent.	Gm.
8 to 10 . . . .	395	1011				
10 to 12 . . . .	162	1024				
12 to 2 . . . .	285	1018				
2 to 4 . . . .	192	1019				
4 to 6 . . . .	128	1023				
6 to 8 . . . .	184	1019				
Total day . . . .	1346	....	0.675	8.97	0.508	6.80
Night, 8 to 8 . . . .	370	1026	0.606	2.22	1.099	4.06
Total, 24 hours . . . .	1716	....	....	11.19	....	10.86
Intake . . . .	1760	....	....	8.5	....	13.4
Balance . . . .	+44	....	....	-2.69	....	+2.54

NOTE.—In bed all day.

THE RATE OF EXCRETION OF UREA AND OF CHLORIDES. Observations were also carried out as regards the kidney ability to excrete urea and chlorides when in the two positions. The findings are summarized in the following table:

<sup>20</sup> Deutsch. Arch. f. klin. Med., 1914, exiv, 120.

THE RATE OF EXCRETION OF UREA AND OF CHLORIDES.

Serial No.	Date.	Position.	Weight, kilos.	Urea.				Sodium Chloride.							
				Urine per 24 hours.	Gm. per liter of urine.	Gm. per liter of blood, Ur.	McLean's index.	Ambrard K.	Gm. per liter of urine, C.	Gm. per liter of urine, D.	Gm. per liter of plasma.				
1	Oct. 29, 1916	Lying	40.2	9060	0.180	1.42	14.13	116	0.074	1.57	15.62	5.959	6.30	+0.341	5.961
	Oct. 30, 1916	Standing	40.2	1382	0.210	7.83	10.89	155	0.064	2.11	2.03	5.778	6.180	+0.402	6.062
2	Oct. 26, 1916	Lying	48.2	3259	0.270	6.78	22.08	146	0.066	3.14	10.20	5.918	5.980	+0.062	5.082
	Oct. 26, 1916	Standing	46.2	3216	0.180	6.01	22.22	337	0.044	3.74	12.02	5.958	5.800	-0.158	5.462
3	Mar. 29, 1917	Lying	41.48	3744	0.165	3.22	12.07	173	0.061	2.5	9.36	5.911	6.00	+0.089	5.769
	Mar. 24, 1917	Standing	41.8	1142	0.195	11.82	14.00	270	0.048	2.75	3.27	5.765	6.437	+0.642	6.292
4	Apr. 30, 1917	Lying	61.25	1512	0.235	16.05	25.61	237	0.032	13.2	10.90	6.148	6.062	-0.086	5.534
	May 1, 1917	Standing	61.25	584	0.255	23.01	19.87	214	0.055	14.2	12.27	6.042	6.094	+0.052	5.672
5	Apr. 24, 1917	Lying	52.6	2976	0.255	8.04	25.7	199	0.057	4.06	12.08	5.951	5.905	+0.014	5.634
	Apr. 25, 1917	Standing	52.6	1032	0.225	18.55	19.14	270	0.048	3.06	3.77	5.800	6.200	+0.400	6.020

*Discussion of Excretion of Urea and of Chlorides.* Four of the 5 cases show a hypersensitive condition of the kidneys when the upright position is assumed in that the rate of excretion of urea is increased. This is clearly demonstrated by the raised McLean's index and lowered Ambard constant. This increased rate of excretion fails to vary directly as the pulse-pressure changes.

The relation of the chloride threshold to the position and pulse-pressure is also most interesting. Four of the cases show a considerably raised threshold when in the upright position. We consider this to be a further indication of irritability.

*The Phthalein Test.* Phenolsulphonephthalein tests were performed upon 4 of the cases while in the recumbent and erect postures. The results are inconclusive, as 2 of the cases show higher rates of excretion when standing than when lying. The observations of Barker and Smith,<sup>21</sup> as well as those of Hempelman<sup>22</sup> also fail to establish any definite facts in this particular. Hempelman's observation that the most marked decrease takes place in the first hour is not confirmed by our results.

*Findings.* 6 mg. phthalein intramuscularly in lumbar region.

Serial No.	Position.	First hour.	Second hour.	Total.
1	Lying . . . . .	61	21	82
	Standing . . . . .	51	22	73
2	Lying . . . . .	52	10	62
	Standing . . . . .	76	18	94
4	Lying . . . . .	70	26	96
	Standing . . . . .	70	16	86
5	Lying . . . . .	64	23	87
	Standing . . . . .	75	17	92

**PROGNOSIS.** As regards the prognosis in these patients there is considerable difference of opinion, but the general consensus seems to be that with an improvement in their general tone and muscular development the condition will spontaneously disappear in later life. There is little danger that a true nephritis will develop if it has been excluded at first. Senator<sup>23</sup> believes that most cases can be traced to a low-grade inflammatory involvement of the kidneys, and for that reason he gives a doubtful prognosis. Heubner<sup>24</sup> has reported 1 case that came to a postmortem examination, the cause of death being cerebral embolism. On examination the kidneys were normal.

**TREATMENT.** Treatment has not been very satisfactory in most cases. Jehle used spinal and abdominal supports, which relieved the lordosis, with considerable satisfaction. Exercises which increase the muscular tone, especially that of the lumbar muscles, has proved beneficial in other cases. Working upon the theory that the albu-

<sup>21</sup> AM. JOUR. MED. SC., 1910, cl, 44.

<sup>22</sup> AM. JOUR. DIS. CHILD., 1915, x, 418.

<sup>23</sup> Monographic Medicine, i, p. 413.

<sup>24</sup> Berl. klin. Wehnschr., 1907, xlii, 1.

minuria was associated with a diminished coagulability of the blood, Wright and Ross<sup>25</sup> treated a few cases with calcium, for which they claimed favorable results. One of our cases (Serial No. 1) we treated by a spinal brace, with an abdominal support, with a complete disappearance of the albuminuria and a marked improvement in his general condition.

**CONCLUSIONS.** In considering our findings we believe that the condition of orthostatic albuminuria is a general systemic disturbance, manifesting itself in faulty development, as shown by a general viscerotonia, a "drop heart," a generalized muscular and visceral atonia, which we know to be associated with varying degrees of vasomotor instability. The symptoms so commonly complained of, such as headache, lassitude, constipation and loss of weight, are the natural results of physical conditions. The increased lordosis that is usually present we consider to be a symptom due to the faulty muscular development and tone of the lumbar muscles. This exaggerated lordosis is well recognized in many muscular dystrophies and atrophies and in other conditions involving the lumbar and abdominal muscles. The low pulse-pressure is undoubtedly the cause of the albuminuria rather than a mechanical interference with the venous return from the kidneys. To us it is an exceedingly interesting fact that the pulse-pressure can be lowered to almost the same degree by artificially producing lordosis while in the horizontal position as when erect. The albuminuria in all our work varied inversely as the pulse-pressure, regardless of the position.

### STUDIES IN FRACTIONAL ESTIMATION OF STOMACH CONTENTS. III. EFFECTS OF HYDROCHLORIC ACID THERAPY ON THE ACID TITER OF THE STOMACH DURING DIGESTION.<sup>1</sup>

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In previous articles by the author<sup>2</sup> the method of fractional estimation of stomach contents was chosen as a means of studying the direct effect of alkalis upon gastric digestion. The mode of

<sup>2</sup> *Lancet*, 1905, ii, 1164.

<sup>1</sup> This study was carried out under the grant of a George Blumenthal, Jr., Fellowship in Pathology.

<sup>2</sup> Crohn and Reiss: *AM. JOUR. MED. SC.*, 1917, clv, 857; Crohn: *AM. JOUR. MED. SC.*, 1918 clv, 801.